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The Ambivalent Role of Mimetic Behaviors in Proximity Dynamics: Evidences on the French "Silicon Sentier"

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Le rôle ambivalent des comportements mimétiques dans les dynamiques de proximité : évidences à partir du « Silicon Sentier » français

Résumé

Cet article examine le rôle des comportements mimétiques dans les processus de co-localisation. Nous montrons que la proximité géographique n'est pas une condition nécessaire et suffisante de la performance collective des clusters. D'autres types de proximités caractérisent les clusters, et, parmi les nombreuses voies d'analyses des clusters, nous montrons que l'approche par les comportements mimétqiue est certainement l'une des voies les plus prometteuse. Les comportements mimétiques de localisation (en économie et sociologie) sont introduits pour montrer que les processus de co-localisation sont plus le résultat de la séquentialité, de l'incertitude, de la légitimité et des interactions non-marchandes que celui de décisions autonomes ou d'interactions purement stratégiques. Selon le type d'interactions mimétiques à l'oeuvre dans la formation des clusters, la nature des proximités socio-économiques peut différer et avoir une influence forte sur la stabilité dynamique des clusters. L'ensemble de ces considérations théoriques est illustré à travers le cas emblématique du Silicon Sentier parisien, cluster qui a regroupé près de trois cents entreprises de la net-économie durant le gonflement de la bulle Internet.

Mots-clé : cluster, interactions mimétiques, proximité, stabilité, Silicon Sentier

The Ambivalent Role of Mimetic Behaviors in Proximity Dynamics: Evidences on the French “Silicon Sentier”

Abstract

This articles examines the peculiar role of mimetic behaviors in co-location processes. We start showing that geographical proximity between agents and/or firms is not a sufficient nor necessary condition for the collective performance of clusters. Other types of socio-economic proximities characterize clusters, and our purpose is to show that, among the several ways to analyze the complex links between proximities and clusters, the theoretical outlook on the role played by mimetic interactions in co-location processes are certainly one of the most promising. Mimetic behaviors of location (in economics and sociology) are introduced in order to demonstrate that co-location processes can be the result of sequentiality, uncertainty, legitimacy and non market interactions, rather than full rational and isolated decisions and pure strategic market interactions. According to the type of mimetic behavior at work in the clustering process, the nature of socio-economic proximity can differ and have a strong influence of the “evolutionary stability” of clusters. All these theoretical considerations are illustrated through the emblematic French case of “Silicon Sentier”, cluster which has gathered together three hundred firms of the French net-economy (the famous “dotcom”) during the Internet bubble swelling.

Keywords: cluster, mimetic interactions, proximity, stability, Silicon Sentier

JEL : D83, R12, R30

Introduction: proximities and clusters

The notion of proximity has been the subject of a growing literature in economic geography and regional science in the last ten years, particularly in Europe around the works of Kirat and Lung (1999), Torre and Gilly (2000) and, more recently, Pecqueur and Zimmermann (2004), Morgan (2004) and Boschma (2005). In parallel, the increase of the "cluster" phenomenon as a new paradigm of local development in the knowledge society, in spite of critics (Martin and Sunley, 2003), has invited scholars to understand the complex links between geographical proximity and innovation (Zimmermann, 2002; Boschma, 2005). Our contribution deals with this topic.

There are certainly several ways to analyze the complex links between proximities and clusters, from the empirical study of relational aspects of proximity with monographies to the study of knowledge spillovers in clusters with econometrical analysis. In this paper, we focus only on one of there, and maybe an original one, through the role of sequential interactions and mimetic behaviors in the economic process of co-location. The purpose is to understand how firms converge more or less rapidly in their decision to locate close together (geographical proximity), and how this convergence process give rise to other proximities, defined as socio-economic at this stage. The first interest is to show that geographical proximity does not be a sufficient nor necessary condition of the collective performance of clusters. As a matter of fact, some "ICT clusters" (Quah, 2000) in the world have had difficulties to resist to the recent bubble and crash of net-economy values – as Silicon Sentier in Paris developed below – while others have pursued their growth and reconverted to other technologies, such as Silicon Valley in USA obviously, and Sophia Antipolis in Europe. Other proximities (socio-economic ones) characterize clusters, and their nature is strongly correlated to the stability of clusters[1]. The second interest is that we focus on the convergence of locational choices through the process of mimetic (or herd) behaviors. In that sense, we do not only focus on the coordination mechanisms at work in clusters, but either on the mechanisms of location, generally the privilege of the new economic geography models based on market interactions. Here again, we want to show that according to the mimetic process of co-location, the nature of socio-economic proximities can differ and have a strong influence on the stability and the performance of clusters.

In a second section, we discuss the definitions and propose a typology from the works just before-mentioned, not in the goal of deconstruction of all the previous definitions, but in order to clarify and use our own typology in the rest of this contribution[2]. In the third section, we introduce the notion of mimetic behavior of location – associated to the notion of locational norm (Vicente, Suire, 2005) – in order to show that co-location processes can be the result of sequentiality, uncertainty, legitimacy and non-market interactions, rather than full rational and isolated decisions and pure strategic market interactions. In section four, we try to demonstrate that the basic nature of socio-economic proximity linking firms in cluster can vary according to the kind of mimetic behavior – or dominant one – in the co-location process. Section five gives an empirical illustration with the emblematic French case of "Silicon Sentier", cluster which has gathered together three hundred firms of net-economy (the famous "dotcom") during the NASDAQ bubble swelling[3]. The rapid success (1998 –

1 We define stability in a dynamical and evolutionary sense, i.e. a stability in performance and growth, and not the neoclassical stability property, strongly associated to a notion of equilibrium (Boschma and Lambooy, 1999).

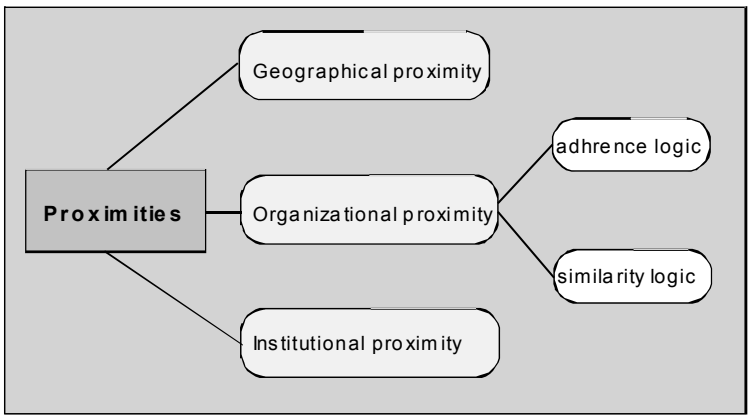
2 The typology proposed in the paper has been discussed with Michel Grossetti, Olivier Bouba Olga and Christophe Carrincazeaux. The two formers have compiled a brief research note of these discussions (Bouba Olga, Grossetti, 2005).

3 The empirical illustration has been constructed from both 70 interviews in the cluster (managers essentially) and a review of newspapers in the period 1998-2002.

2000) and the sudden decline (2001 – 2002) of this famous cluster invite us to pursue the reflection on the links between collective efficiency of clusters and aggregated performances in one side and the nature of socio-economic proximity and geographical proximity in the other side. This is the aim of section six. Section seven proposes some concluding remarks and discusses a research agenda on clusters and regional performance.

Proximities : some preliminary remarks on definitions

The concept of proximity has been developed at the beginning of 90s by a French research group of economists and sociologists. Their first motivation has been to explain industrial agglomeration, such as industrial districts, scientific park or "innovative milieux" with the concern to go beyond the role of market interactions and externalities as exclusive reasons of agglomeration and territorial dynamics. At the opposite, they insist on the role of non market interactions through the links built up between firms or between firms and institutions, such as joint venture, trust-based co-operation, formal agreements, interpersonal networks, and so on… The second motivation has been to propose un analysis grid which permits to study the economic coordination not only through the local dimension but either through non territorial coordinations such as transnational networks or other more or less codified and formal agreements between firms. The third motivation has been to introduce an institutional dimension through the role of informal institutions such as trust, or formal ones such as competition rules or intellectual property rules. Finally, the general motivation closely linked to all of these specific ones has been to enter in the black box of externalities through the concept of proximities and to develop a detailed analysis of coordination mechanisms at work in the geography of innovation.



(Source: from Torre and Gilly, 2000)

Figure 1: A first typology of proximities

Among the whole of definitions and classifications or categorizations of proximities (particularly in the French literature), the synthesis proposed by Torre and Gilly (2000) is the most convincing and representative. *Figure 1* summarizes their work. They divide the general concept of proximity in three specific ones.

Firstly, geographical proximity can be used to discuss what that geographically separates agents (individuals or organizations). The concept of geographical distance is certainly the most appropriate and tractable in order to capture and measure the level of this proximity in real situations. But it would be sometimes more relevant to introduce others

aspects developed by geographers, such as access times, in order to take into account the social distortion of geographical space due to the production of infrastructures (transport and telecommunication mainly). It would be tempting to introduce other social aspects, but with a risk to interfere with other kinds of socio-economic proximities, so that the focus on distance and time (maybe cost) of access is sufficient to define the level of geographical proximity.

Secondly, organizational proximity is defined in order to capture the separation or closeness degree between individuals and/or organizations in a strictly economic sense. According to Torre and Gilly (2000), we can distinguish two logics which govern the organizational proximity. On the one side, in the adherence logic, organizational proximity can be defined (and eventually measured) by the degree and the intensity of direct interactions between agents. On the other side, in the similarity logic, organizational proximity can be defined according to criteria which gather agents in classes (capabilities and knowledge for individuals or size and sector for firms, …). These two logics can be interlinked, but not necessarily, and organizational proximity is not *a priori* correlated to geographical proximity. Imagine the relations in the community of economists : two researchers can be installed in the same laboratory or university and do not develop interactions, whereas two researchers can be located in two separated university in Europe and have strong interactions in co-publication activities (using travel and e-mail).

Thirdly, institutional proximity is generally defined in order to capture what Amin and Thrift (1993) has earlier described as the "institutional thickness". According to Torre and Gilly (2000), and either Kirat and Lung (1999), the institutional proximity refers to the fact that agents share the same space of representation, face same incentives and constraints of their peculiar legal and economic environment in terms of competition rules, managerial culture and so on. Clearly, institutional proximity is introduced in the typology with the aim to add a collective dimension in the game of interactions, because of the weakness of individualistic approaches to take into account cultural, political and historical dimensions of economic coordination. Thus, institutional proximity appears as a facilitator of coordination and its intrinsic geographical dimension can explain the easier convergence of behaviors of agents facing a common future. Recall our previous story of economists. Two economists could have less difficulties to co-publish a paper if they share the same objective to participate to the charisma and renown of their university and their region. It is even easier that they face the same professional constraints in terms of support of valorization of their work. It could be more difficult for two faraway economists because they can enter in conflict if they don't share the same academic and professional constraints of publication (a book in a prestigious collection for one, and well-diffused national reviews for the other).

This typology has been already used to develop analysis of regional development, in terms of performance of clusters and innovative regions, and has given robust proofs of its relevance to underlie organizational and geographical aspects in the analysis of knowledge creation and diffusion. The value-added of these works compared with anterior approaches is in the fact that clusters performance can be deduced from the peculiar combination of all of these proximities, and not directly of some presupposed virtues of spatial agglomeration of activities. Nevertheless, some critics have been formulated both on the clearness of the categorization, especially the confusion in the distinction between organizational proximity in its similarity logic and institutional proximity (Boschma, 2005), and on the difficulties to derive and build some tools to measure and test this typology in empirical micro-analysis (Bouba Olga and Grossetti, 2005).

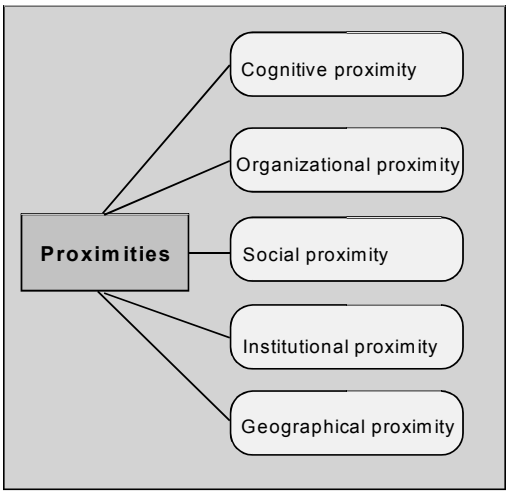


Figure 2: a second typology of proximities

(source: from Boschma, 2005)

For Boschma (2005), the concept of proximity has to be declined in much more categories than the previous typology (*see figure 2*). In particular, there is a strong necessity to isolate the cognitive dimension to the organizational one, and to dissociate the social dimension (through the embeddedness of individuals in the sense of Granovetter) from the institutional dimension. In that way, the degree of cognitive proximity is defined as the "distance" which separates individuals or organizations in terms of knowledge base. The introduction of the concept of cognitive proximity in the industrial dynamics leads to go beyond the functional and *ad hoc* distinction between tacit and codified knowledge by focusing on cognitive capabilities of individuals or organizations rather than the intrinsic nature of knowledge, which is sometimes difficult to perceive. We can measure a cognitive proximity between agents independently of a notion of organization or economic relations. Hence, the organizational proximity refers only to the nature of agreements conclude between agents. We could measure a degree of organizational proximity through the relational dimension of a governance matrix or a network organization that relies agents, and we can deduce that agents are organizationally close each other according to their respective position in this matrix or network. The organizational proximity are either to be distinguished to the social proximity. This later refers to interpersonal links between individuals, and can be evaluated according to the degree of friendship (or kinship) and trust between individuals. The social proximity for Boschma (2005) is explicitly linked to the well-known notion of embeddedness (Granovetter, 1985). In that way, social proximity strongly refers to past interactions, for instance through old and durable scholar or sportsmanship relations. These relations engender trust and loyalty and can be a source of stability in economic relations. Opportunistic behaviors are not totally excluded, but are statistically reduced by social proximity. The fourth dimension is relative to the institutional proximity. She refers strongly to the institutional proximity of Kirat and Lung (1999) and Torre and Gilly (2000), but sets aside the embeddedness dimension of social network and trust. Maybe the key criteria which allow to distinguish social from institutional proximities is that first the later can be geographically identified in spaces, such as language, cultural habits of legal context of competition, whether social networks are not easy to identified in a geographical sense. (Our friends are not necessarily our neighbors and our young economists coming from the same

university are nowadays professor in largely separated universities). Second, the social proximity refers to an explicit micro-level of analysis – the identification of relations between individuals – whether the institutional proximity refers to an explicit macro-level of analysis, through the constrained weight of formal and informal rules on the individual behaviors. Finally, geographical proximity is defined in a very restrictive sense; that's a direct consequence of the "lushness" of the other forms of proximity. It refers only to the spatial distance between individuals and/or organizations, and has an importance in the analysis of the performance of clusters only if it is coupled with the others and according to their specific combinations.

The first merit of this typology is to clearly avoid the confusions due to intertwined definitions of proximities in the approach of Torre and Gilly (2000). In the five-proximities approach of Boschma, the different levels of analysis are clearly distinguished. Particularly, the cognitive level is well dissociated to the organizational one, and the micro-level (through the definition of social proximity) is clearly dissociated to the macro one (through the definition of institutional proximity). In real situations, all of there are interlinked at different degrees, but a clear theoretical distinction leads to a better understanding of the weight of each of there in empirical analysis. In that sense, the second merit of this typology is that she allows to appreciate the performance of firms (micro-level) and clusters (meso-level) according to the several combinations of proximities. In that way, one of the originality of this typology is to better understand why some peculiar combinations can lead to low performances of firms and chronic instability of regions. For instance, too strong cognitive proximity in technological capabilities linked to geographical proximity can lead to unplanned spillovers when firms compete in strictly same product market (see the example of Silicon Sentier below). As too strong social or institutional proximities can lead to collective lock-in by preventing individuals or firms from searching faraway information. Nevertheless, it seems awkward to integrate in a same analysis all of these dimensions of proximity, and to clearly dissociate the concern of micro-analysis from the concern of macro-analysis. To our knowledge, it does not exist papers which have succeed in the integration of all of these dimensions, certainly for reasons of lack of robust empirical methodologies in the actual state of the art.

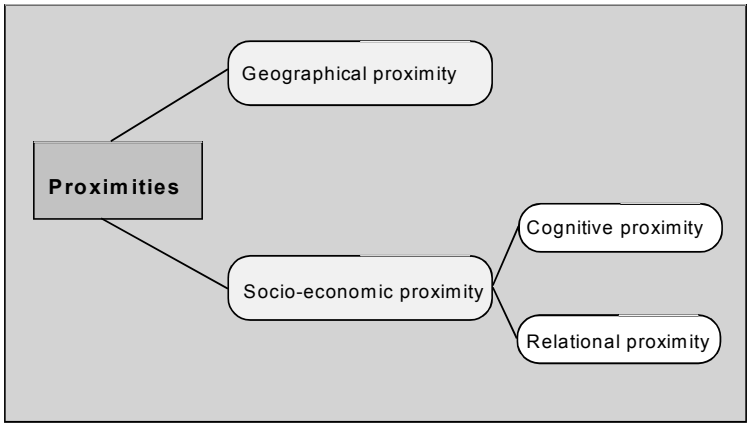


Figure 3: a third typology of proximities

(source: from Bouba Olga and Grossetti, 2005)

That's the main reason why Bouba Olga and Grossetti (2005) propose to partly simplify the typology of proximities. They focus only on the micro-level of analysis (*figure 3*) and associating measurement tools to each definition of proximities. Maybe the work is less

ambitious than the two formers, because it dismisses the macro-level and the associated institutional proximity, but nevertheless relevant, because of the constraint self-imposed by authors in the association of theoretical definitions to empirical methodologies. In their work, proximities are declined at a first level in only two dimensions. The geographical proximity and the socio-economic one. The geographical proximity can be summarized as the works of Torre and Gilly (2000) and Boschma (2005). She refers to the distance which separates agents (individuals or organizations) and can be measured with the help of distance and cost indicators such as miles, transportations and telecommunication costs and accesses, or more basically by supposing binary situations: we are close each other or not. The socio-economic proximity is defined in a voluntary general way, in order to clearly distinguish the geographical dimension from other dimensions. But such a definition is too large for empirically studies and measurements, even at a strictly micro-economic level. So it has to been decomposed into categories. Bouba Olga and Grossetti (2005) have decided to construct two types of socio-economic proximities. The first one is the cognitive proximity. In spite of the analogy with the concept of Boschma (2005), the definition of Bouba Olga and Grossetti seems to be larger. According to us, cognitive proximity refers to the behaviors and knowledge of agents. Agents are cognitively close each other when they share some conventions and a whole of common values and representations. This cognitive proximity does not refer only to knowledge and technological capabilities, as in Boschma approach, but either on managerial practices, on discourses, economic actions and so on (see the case of Silicon Sentier below). One of the tools that has to be used to identify cognitive proximity is the analysis of discourses and practices of agents through interviews and an *ex post* sort of "pinpointing" which consists to isolate some proximities in behaviors, some routinized behaviors as the so-called "taking for granted" that the sociologist Goffman (1973) recognizes in the construction of collective identities[4]. The second one is the relational proximity. She refers to the basic notion of interaction and structure. Individuals or organizations such as firms are close each other in a relational sense when they share a same interaction structure, make transactions or realize exchanges. The fact that agents are cognitively close each other does not signify that are necessarily in interaction, or simply that have the possibility to communicate. For that, we must identify a communication or an interaction structure. Relational proximity can present several dimensions: agents can be relied directly or indirectly through intermediaries, interactions can be strong and frequent or weak and scarce, interactions can be purely cooperative and horizontal or hierarchical and vertical. What does matter is that an intensity of interaction and communication can be identified in order to measure a degree of relational proximity. For that, several qualitative and quantitative tools are available to construct relational databases: firm networks, such as in the work of Storper and Harrison (1989) or Markusen (1996), financials relations, patents and co-publications (Audretsch and Feldman, 1996), but either social networks such as friendship, scholarship past relations, kinship and so on… which can play a major role in the industrial and innovative dynamics.

Once again, the first merit to this work is to link definitions to measurement tools. In that way, we have at a micro-level an integrated (theoretical and empirical) approach at our disposal. Secondly, we think that it is more relevant to dissociate knowledge and behavioral dimensions from communication and interaction dimensions rather than the social, organizational and institutional ones. At less for one reason, because such a typology avoids the recurrent and maybe intractable confusion and intercrossing between these three levels of analysis in the literature. Thirdly, Bouba Olga and Grossetti show that this typology is useful for the analysis of complex links between individuals and organizations. For instance, they

4 We would like to thank Michel Grossetti for this remark.

show that cognitive and relational proximities at the individual level can engender relational proximity at the organizational level when inter-organizational relations (through networking relations) come from past relations of individuals. Therefore, such a typology is very suitable to analyze, in some peculiar situations, how relational and geographical proximities between firms in innovative clusters can be also the result of past friendship rather than exclusive knowledge transfer problems.

The role of mimetic behaviors in locational choices

Now the purpose is to understand of how proximity links (geographical as socio-economic) emerge. Obviously, literature on this topic is extensive, from new economic geography to regional knowledge economics, or from the weight of market interactions in labor, technology and product spaces and the role of monopolistic competition, to the weight of tacit knowledge, collective learning and inter-firm network in the clustering process. All of this literature has lead to several papers and robust results. Our aim is not to challenge this literature, but either to propose an alternative – and maybe complementary – approach of co-location and clustering process based on mimetic processes of location, in the lines of previous works of Appold (2005), Dalla Pria and Vicente (2005) and Vicente and Suire (2005).

Mimetic behaviors at individual level and mimetic processes at collective level have received few attentions in economics and sociology for at least two mains reasons. Firstly, especially in economics, mimetic behaviors have been until recently associated to irrationality (Kirman, 1992). In a pure theoretical market dynamics, agents interact through the price system, which is the centralizing system of interaction that coordinates agent's decisions. So agents decide in total autonomy, and this autonomy has been a long time the condition of the individual rationality (Orléan, 2002). This traditional way to think about agents in economics has lead to reject all other behaviors such as observation of others, communication and information exchange that can operate in a decentralized system (Vicente, 2003a); and the collective behavior stems only from the straightforward aggregation (the well-known representative agent) of individual decisions and not from a more complex dynamics of direct interactions. Secondly, sociology has historically gives a little place to mimetic interactions, except the works of Tarde (1895). The main reason according to Granovetter (1978) is to find in the sociological tradition in which norms are the result of a strong homogeneity of individual preferences. In this tradition, there is a strong correspondence between the micro and macro level, that is to say that a social or behavioral norm has more chance to diffuse through population that it corresponds to same individual anticipations or preferences. Schelling (1978) has also tried to challenge this tradition because it exempts from focusing on why behaviors and preferences of heterogeneous agents can evolve and converge at a micro level and gives rise to peculiar aggregate macro-structures.

Nevertheless, mimetic interactions are not completely absent in economics and sociology. Some works in these two disciplines have tried to overpass these respective traditions in order, first, to identify the causes and the individual motivations of imitation, second, to study the consequences at the aggregate level. In the concern of clarity, the rest of the section present these works. The links we can operate with the emergence of proximity dynamics and clusters are developed in the following one.

Mimetic interactions in economics

In economics, if we leave aside the centralized model of market interactions, new perspectives on economic interactions open up before us, directly linked to the possibility

agents have to communicate and interact each other. In a decentralized system of interacting agents, we can study the individual rationality of mimetic behaviors and their consequences, through aggregative processes, on collective behaviors. Two kinds of works have investigated this theoretical opening in economics: models of *informational cascades* (Bikhchandani & alii, 1992), also called models of *observational learning* (Manski, 2000), and models of *increasing returns to adoption* (Arthur, 1989), also called models of *interactive learning* (Vicente, Suire; 2005). These models have two strong common denominators. Firstly, agents are heterogeneous according to their preferences and the satisfaction they can obtain from their decisions. Secondly, social interactions, whatever there nature at this stage, are sequential and cumulative, that is to say that actions or decisions of predecessors always produce an information, which can modify the preferences of others. So sequentiality and cumulation are the main processes at work in the evolution of individual preferences. Such processes can lead to norms. Locational norms are ones among many.

Informational cascades have been initially developed by Bikhchandani & alii (1992), in order to explain the emergence of sometimes unexpectedly effects of conformity in population, such as fads or customs, and all other phenomenon in which agents converge strongly on a same behavior or decision. For instance, informational cascades have been theoretically used and empirically tested in financial economics in order to explain speculative bubble and crash in financial markets (Orléan, 2001), or the emergence of standards in technological competition (Geroski, 2000). In a formal way, agents are supposed to have a probabilistic private signal on the better-paid action to choose. At this stage, and in this context of uncertainty, it would be rational for agents to choose the action that statistically gives the higher pay-off. Nevertheless, if agents have also the possibility to observe actions of predecessors, they have to balance their own private signal to the public signal that represent actions of others. Under specific conditions, it would be rational for agents to imitate others and give up their private signal because they infer that others are better informed (statistically speaking)[5]. Then, informational cascades can quickly occur and give rise to convergence on individuals decisions. This convergence process can be interpreted as an aggregation process in which individual heterogeneity (represented by private signals) is neutralized by the weight of collective behavior through mimetic interactions.

We stress on the fact that agents decide according to an observational learning process (Manski, 2000), which means that they have the possibility to reduce the intrinsic uncertainty due to their probabilistic private signal by observing action of others in same situations. This observational learning process exhibits a strong importance in many situations of the economic life where uncertainty plays a major role. In that sense, models of informational cascades have furnished results in contradiction with models of market dynamics through price system. For instance, in finance, uncertainty and observation in financial markets play a major role on market instability, due to contagion phenomenon, and refute the power of auto-regulation in markets[6]. In context of monopolistic competition, game theory and strategic interactions show that differentiation is the most competitive strategy, where information cascades prove that conformity can be at the opposite the rule. Note also that the weight of informational cascades can be stronger since first entrants in the dynamics are supposed to have such an expertise capacity and a reputation that they can influence the trajectory of collective behaviors more easily than in the general case.

5 It's very important to notice for the following sections that pay-offs do not evolve. The only thing that evolve is the probability for agents to obtain this fixed pay-off.

6 It's also very important to notice that the probability to converge to an incorrect cascade, that is to say an inefficient collective behavior, is always possible and depend on the choice of first entrants.

So in economics, the first basis of mimetic behavior we can identify is linked to the fact that agents facing to uncertainty try to reduce it by imitating others. Such a behavior at individual level can achieve to a strong pressure to conformism at a collective level. Nevertheless, uncertainty is not the one source of mimetic interactions. The models of increasing returns to adoption (Arthur, 1989) stress on an another source, closely linked to social interactions, coordination and compatibility. If sequentiality and cumulation work over again, the driving force of imitation is different and based on a another decision process in which networks play a major role. In a formal way, models of increasing returns to adoption are based on the notions of network externalities and interactive learning. Pay-offs agents can obtain from their connection to a network are positively correlated to the number of previous connected agents. The utility or satisfaction of an economic agent will be so higher that he will be connected to a network in which there are many agents than one in which there are just a few ones. The basic idea is that the higher the number of connected agents will be, the higher will be the probability for the agent to communicate, exchange or capture information, in order to increase his satisfaction[7]. (Remember our story of economists. If an economist consider connecting a research group or network in order to exchange empirical data or theoretical ideas, he has more chance to improve his satisfaction by connecting to a world wide network than to a small and unrecognized network). However, this increasing satisfaction depends strongly on compatibility criteria governing interactions and communication between connected agents. For Arthur, theses problems of compatibility are essentially technological ones. But we can easily show and demonstrate that there could be also cultural or social, such as language, capabilities or knowledge. (If the economist is a French one and does not speak English, he probably has troubles to increase his satisfaction from his connection to the world wide network of research. Of course, as in the spirit of Arthur works, he could have troubles if he does not use software in majority used by others in forums and blogs. He could have also troubles in terms of knowledge if he wants to connect to an astrophysicist association).

Network externalities, coordination and compatibility are essential in the growth of networks and in the competition between networks. Joining a network increases the satisfaction of the joiner and of the others who have already joined. In that sense, new connections reinforce the probability of forthcoming connections, in such a way that the network which connects more people than others and reaches a critical mass, through a positive feedbacks mechanisms (Arthur, 1990), can progressively and sometimes definitively prevails on others[8]. Once again, we recognize a mimetic process in the formation of networks, but the learning process that governs individuals decisions in not (only) an observational one but (either) an interactive one: agents tend to imitate others not because of uncertainty but, in spite of their heterogeneity in initial preferences, because of interactions, communication and exchanges or transactions. In these processes, the heterogeneity of individual preferences and the necessity to interact in networks can lead to norms or conventions, that is to say to a progressive neutralization of heterogeneity, favored by individual imitation and the collective dimension of positive feedbacks.

7 As in the previous note, it is important to notice that in models of increasing returns to adoption, at the opposite of models of informational cascades, pay-offs evolve. There are an increasing function of the number of members who have joined the network.

8 Notice, once again, at the opposite of models of informational cascades, that the collective efficiency grows with the number of connected agents, because of the evolving pay-off structure.

Mimetic interactions in Sociology

In economics, uncertainty but either coordination and exchange are the main sources of mimetic behaviors. In sociology, we are going to show that literature displays again the role of uncertainty but also the role of legitimacy and recognition. These later dimensions are neglected by economists, developed by sociologists, and present in a lot of situations in which mimetic interactions occur. The common denominator of the three approaches developed below is that mimetic processes are largely compatible with the individual rationality, and so, we have to pay attention to these processes more than in the past.

Di Maggio and Powell (1983) have developed a detailed institutional analysis of pressures which force to homogeneity in organizational fields, that is to say in classes of organizations which operate in same economic environments. According to us, the well designed concept that captures such an homogeneity is the concept of isomorphism, which can be defined as dynamical process driving each organization to resemble at ones which face the same environment. Of course, market pressure is certainly one of the first forces which lead to homogeneity (and monopoly), because market dynamics and power select only firms and organizational practices that perform. Nevertheless, it would always be possible to observe diffusion of practices in organizational field without the possibility to consider than there are better than another ones. For instance, Strang and Macy (2001) have shown, using conceptual categories of Di Maggio and Powell (1983), that the rapid diffusion of quality circles practices in a majority of US firms in eighties, and the following rapid decline, have been more the result of research of legitimacy and recognition for firms, than the effective efficiency of such a practice.

So Di Maggio and Powell (1983) identify three categories of institutional isomorphism. Only one of there concerns a pure mimetic process. According to us, mimetic processes can be defined as a rational response of agents to uncertainty in emergent contexts (see for instance the peculiar context of *dotcom.* at the end of nineties in the following sections). In emergent context, it would be more rational to imitate agents perceived as having strong legitimacy than to spend time and money to search and experiment solutions (for instance organizational practices). As a matter of fact, behaviors or conventions can quickly diffuse in organizational fields according more to mimetic processes than real experimentations and explorations of organizational alternatives and their respective performance. So coupled with uncertainty, as in models of informational cascades, legitimacy is one of the essential individual motivations leading to collective behaviors.

Similarly, Granovetter (1978) has developed an approach of mimetic interactions based on legitimation, but with a different theoretical methodology. For him, there is a strong necessity to go beyond the explanation of collective behaviors as a simple aggregation process of agents endowed by homogeneous preferences. At the opposite, Granovetter, with his threshold model of collective behavior, tries to show that norms could emerge from a sequential interactions dynamics between heterogeneous agents. For that, he has to suppose a form of interdependency between interacting agents, close to the observational learning process developed in the models of informational cascades, and the idea of legitimacy of Di Maggio and Powell (1983). All of these considerations are captured by the concept of threshold: each agent are endowed by a threshold which can be defined as the number of agents in a fixed population who have already participated to a collective action (a run riot or a strike for instance), and above which each agent decides to participate also. So each agent decides according that a sufficient proportion of the population – his threshold – have decided to participate to a collective action. The individual thresholds, different for each agent, is a

sort of mark-up of legitimacy of individual decisions. Moreover, the statistical distribution of thresholds is also the mark-up of the heterogeneity degree of the population in preferences.

From this concept of threshold, Granovetter can study the dynamics of individuals decisions and theoretically observe the role of mimetic interactions in the emergence of collective behaviors. Imagine for instance a population of *n* agents (one hundred for instance) in which each has a threshold equal to 0 to participate to a strike (homogeneity in preferences), and each agent decides sequentially from 1 to n. It's easy to understand that all the population is in strike at the end of the process. Now, suppose that each agents has a threshold equal to n-1. If they decide again sequentially from 1 to n, and in spite of the perfect heterogeneity in individual preferences, the collective behavior emerges also and all the population is in strike, whereas most of people are not really convinced by the purpose of the strike. A last, imagine for instance that the agent 4 has a threshold equal to 4 (instead of 3), and the thresholds of others do not change. In this case, for just a marginal change in the distribution of individual preferences, the collective behavior significantly changes, and we can observe only three grumblers in a apparently pacified population. Once again, agents imitate others when they think it is legitimate and reasonable to act like others. And once again, mimetic interactions are based on rational behaviors, because each agent is supposed to compute and balance his individual threshold to the aggregate choice of predecessors.

More recently, Hedström (1998) has try to propose a general discussion of imitation in the field of social sciences, showing that imitative behaviors can lead to sometimes surprising aggregate dynamics, but not always infallible collective behaviors. First, according to him, imitation is a multifaceted type of behavior. As a matter of fact, we have to distinguish, in a general category of intentional imitation, imitation as an end from imitation as a means. Imitation as an end can be explained by the fact that agents have a strong preference for conformity and do not compute if this conformity is profitable or not for them. At the opposite, imitation as a means is perceived as a more sophisticated behavior that engenders legitimacy and/or better decisions.

The very important question puts Hedström from this discussion is whether or not agents gain from imitation. Using and simulating a *Polya Urn based model* in order to consider agents who act by observing past choices of others, Hedström discusses under what conditions imitation gives rise to collective efficiency (collective behaviors present a strong stability property) or to chronic instability (collective behaviors present an erratic and cyclic diffusion curve). One of the essential criterion of these opposite results is in the very nature of functions of pay-offs. In fact, Hedström implicitly tries to balance the respective results above-discussed of Arthur (1989), who had already used Polya Urn models, and Bikhchandani & alii (1992). If pay-offs endogenously evolve according to the number of imitative agents, that is to say if the value of the result of decision increases proportionately with the number of agents who have chosen this decision, the aggregate dynamics gives rise to a stable collective behavior. We can interpret such a interaction dynamics as a self-fulfilling process. At the opposite, if this value does not increase (maybe decreases), collective behaviors are instable regarding to exogenous shocks and we assist to the so-called fads and fashions identified by Bikhchandani & alii (1998), or short-lived success stories identified by Strang and Macy (2001).

Table 1 : theories and models of mimetic interactions in economics and sociology

	Common denominators	uncertainty	legitimacy	Coordination and compatibility	Evolving pay-offs
Bikhchandani & alii (1992, 1998)	Rationality, heterogeneity, sequentiality and cumulation	Balance between private signal and public information of predecessors			
Arthur (1989)				Network externalities, interaction and co-operation	Increasing return to adoption
Di maggio & Powell (1983)		Emergence of organizational fields	Following leaders in organizational fields		
Granovetter (1978)			Following leaders in social structure		Increasing utility with collective behavior
Hedström (1998)			Do not be marginalized in communities		Self-fulfilling or self-defeating process

If we try to sum up this short survey on mimetic interactions in economics and sociology (see table 1), one has to keep in mind that uncertainty, legitimacy, coordination and evolving pay-offs or utilities are strong basis of imitative behaviors. To put in evidence such individual driving forces, one has firstly to suppose that agent are rational, heterogeneous, sequentially and cumulatively interact. Secondly, it would always be possible to suppose that agents are not either homogeneous in terms on their respective influence on others (fashion leaders), even if this crucial aspect has been nowadays the subject of little attention in formal analysis and has to be gone into more deeply in the future.

The complex links between mimetic interactions and proximities

Now the goal is to show how mimetic interactions are particularly well-suited in the explanations we can provide on differentiated proximity dynamics. We propose an analysis grid of clusters formation according to the complex links between geographical and socio-economic proximities and the nature of mimetic interactions working in the co-location process.

For that, recall that we have supposed that market interactions (through price system) are not the only ones which govern co-location processes and that agents have now the possibility to observe or interact directly each others. So in that way, we can go beyond the stage of concepts and definitions of proximities by focusing on the interaction-based processes giving rise to convergence of individuals decisions[9].

[9] In a previous paper (Vicente, Suire; 2005), we have spoken about "locational norms" in order to define such convergence processes.

The role of uncertainty and legitimacy in the dynamics of geographical and cognitive proximities

On the one hand, we can try to demonstrate that uncertainty and legitimacy are strong foundations of geographical and cognitive proximities giving rise to economic agglomerations or clusters, sometimes with an high degree of geographic charisma (Appold, 2005) or collective identity (Dalla Pria & Vicente, 2005) and a surprising weakness of local interdependences. For geographical proximity in a first stage, we have to imagine that firms decide to locate somewhere sequentially, have in their possession an (incomplete) information on the intrinsic features of each alternatives of location, and can observe predecessors they judge as relevant in their location decision making. These relevant predecessors can be generally supposed to be others firms of the sector which are in competition or sharing a segmented demand and having a strong reputation on markets. It is not necessary to suppose pure strategic and market interactions between firms and minimization of distance cost to consumers (as in monopolistic and strategic competition models) in order to observe co-location processes. At the opposite, we simply need to suppose that firms facing a strong uncertainty on the resulting pay-offs of each alternative of locations imitate other firms they imagine to be better informed. Moreover, this dynamics can be self-reinforcing because the further the convergence in locations occurs, the further uncertainty decrease and legitimacy of location decision making increases (at least in short term). This increase in legitimacy can be illustrated easily. For instance, firms are more well placed to attract external financial resources since there are located in a successful territory. There are also well placed to attract dynamic labor task in a competitive labor market in which fashionable places are in great demand for scientist or engineers.

So geographical proximity can be the dynamic result of mimetic interactions in some peculiar situations. These situations are generally ones where firms cannot optimally choose locations because the required means and resources are not easily and clearly identified and the demand is not spatially bounded to local markets but more global ones. In these situations, mimetic behaviors in locational choices can be rational. There reduce uncertainty and increase legitimacy by a sort of collective, symbolic, capital, sometimes labeled (Silicon … or … Valley), which gives rise and increases individual reputation, even if local interdependences – i.e. relational proximity – is weak.

In the literature, as well as our researches on the French case of Silicon Sentier recalled below, some papers have explicitly or implicitly displayed this role of mimetic interactions in the formation of clusters and geographical proximity. For instance, Appold (2005) has recently studied the locational patterns of U.S. industrial research through the development of research parks. According to him, one of the main reasons of the co-location process of research units is in the role of mimetic behaviors in decision making, even if operational conditions for dispersion exist. In a context of uncertainty, decision makers search for signal to help them to choose suitably. Appold writes that *"the powerful signal, indicating that a location is an 'appropriate' choice, might be the presence of other, similar, firms"* (p. 20), and defends the assumption that in some several situations, the growth of clusters is symbolic representation rather than collective functional interdependences. Longhi (1999) has stressed on the successive stages of development of Sophia-Antipolis in France. According to him, the first stage of development of this cluster is essentially more the result of an attraction process of plants of multinational firms, based on an active politics of marketing, than an endogenous process of growth based on knowledge transfer and strong local interdependences. Following Longhi, we could think that first locations of firms such as IBM et Texas Instrument in the place have played a strong signaling role for multinational firms which want to locate plants in a fashionable and well reputed European place. Lastly, if we focus on commercial activities

rather than industrial ones, we could also find in the literature works that display the role of mimetic behaviors in co-location processes and geographical proximity. For instance, Caplin and Leahy (1998) show how after a long dormant period, lower Sixth Avenue in New York has undergone a rapid revitalization. Theoretically, they develop an approach of economic interactions and decision making in which individual preferences evolve according to the past choices of others. Using a model of informational externalities, they show how the location of one retail business, BB&B (Bed Bath & Beyond), in spite of the bad reputation of Sixth Avenue in its lower part, has triggered off a rapid success and a surprising co-location process of retailers. The explanation is well-suited with mimetic behaviors under uncertainty: most of retailers perceived a bad perception of this part of Sixth Avenue, except one. The location of BB&B, and its commercial success, has modified the perceptions and preferences of others, and generates a rapid locational cascade. We can probably imagine that if BB&B had not decided to locate in this place, this latter would have been dormant for a long time.

Uncertainty and legitimacy are strong basis of geographical proximity and there can either be a strong basis of cognitive proximity. Recall that cognitive proximity can be defined according to distance on knowledge and capabilities between agents (Boschma approach) or distance in managerial practices, discourses and routinized behaviors (Bouba Olga & Grossetti approach). This general notion of cognitive proximity can be well depicted through the sociological notion of "collective identity" (Dalla Pria & Vicente, 2005) stemming from a convergence of individual behaviors, knowledge, practices or discourses, and not necessarily of communication and coordination. Once again, uncertainty and legitimacy works strongly in this cognitive convergence process. For instance, Bikhchandani & alii note that mimetic interactions play a major role on cognitive proximity and adopted behaviors in the field of medical practices, especially when indecision and doubt stemming from new illnesses are strong. New treatments and dubious practices can quickly spread in the community of physicians, on the basis of weak information. Geroski (2000) has shown that technological standards not only arise from compatibility and network externalities in technological choices, as in most papers in competing technologies. Mimetic behaviors also play a major role in technological adoption and in the so-called S-shaped curve of diffusion because of legitimacy and badwagon effect induced by social imitation. Such a collective behavior can arise when the uncertainty on features of each technological alternatives is so strong that agents prefer to observe others, peculiarly well reputed others. Lastly, we can recall the example of Strang and Macy (2001) on the surprising success and rapid decline of "quality circles" as managerial practices in the eighties. According to him, and following Di Maggio and Powell (1983), such a phenomenon in mainly due to the uncertainty of the beginning of the post fordist period. To explain this strong collective identity and cognitive proximity based on quality circles, they propose a model of mimetic behavior and adaptive emulation in which the role of pioneering adopters (big U.S. firms which first explore this Japanese managerial practice) is fundamental in the convergence process and the wide diffusion of this practice in U.S. firms.

The role of coordination and compatibility in the dynamics of geographical and relational proximities

On the other hand, we can try also to demonstrate that coordination and compatibility in location decision making between agents are strong foundations of geographical and relational proximities giving rise to clusters. At the opposite of the previous case (uncertainty, legitimacy and cognitive proximity), these clusters exhibit strong local interdependences and firms networks. If *collective identity* can play a role in these clusters, *relational assets* remain their key-feature. Uncertainty and legitimacy are not the one motivations which lead to convergence in location decision making and so geographical proximity. Firms can also locate close together for more strategic and well informed reasons. In that sense, this convergence

process in based on externalities that differ from the informational externalities of models of locational cascades. Here, geographical proximity is the result of a sequential process in which firms try to intentionally take advantages of proximity through the weight of knowledge and technological externalities (Torre & Gilly, 2000; Boschma, 2005). Such a process is close to the model of increasing returns to adoption of Arthur (1989, 1990): firms sequentially locate, and for that compare the benefits of each place according to their own preferences and the location of predecessors they consider relevant[10] in their production and innovation process. If we suppose that knowledge and technological externalities have a strong local and geographical dimension, as theoretical and econometrical literatures say (Audretsch & Feldman, 1996), but sometimes in contradictory ways (Breschi & Lissoni, 2001), we can infer that geographical proximity is the result of a cumulative process of mimetic interactions based on coordination between firms and compatibility in their location decision making.

So, innovative clusters can progressively reinforce their attraction according to a convergence process of location decision making. This convergence process gives rise to a relational proximity because of the weight of local interdependences the collective process of innovation engenders. Overall, the literature on clusters associates the links between geographical and relational proximity to the weight of tacit knowledge and face to face interactions. That is certainly generally the case, but more as a result of interactions dynamics than an irrefutable assumption of the economic coordination (Breschi & Lissoni, 2001). We think that mimetic processes of location based on network externalities are better well-suited to explain such a result. In opened innovation processes in which technological convergence is crucial to compete in monopolistic markets, compatibility in "system products" is strongly correlated to compatibility in location decision making, as Quah (2000) shows in the case of ICT clusters. And network externalities playing at the technological level play also at the social level, through the development of knowledge-based social networks. Here, the very nature of competitive markets is important: If mimetic location processes based on uncertainty and legitimacy are correlated with local competitive markets, mimetic location processes based on network externalities are above all characterized by global monopolistic ones (Vicente, Suire; 2005). That's why we think that Arthur has transfered his model of monopolistic competition in technologies to spatial monopolies.

For instance, Longhi (1999), in his paper on the evolving structures of Sophia-Antipolis has noticed that the cluster has had a phase of endogenous growth in the nineties due to the emergence of social networks in telecommunications and health industries. These social networks has been developed after a voluntarist politics of regional planners to invest in research public centers, which have progressively given rise to start-up and spin-offs in the cluster. So after the location process in the eighties based on an exogenous process of attraction of firms directed from outside and with weak internal retations – we have interpret this process as a mimetic one based on uncertainty and legitimacy – the cluster has risen above the crisis phase by a mimetic process based on technological complementarities, compatibility and network externalities, in which social networks and relational proximity have played a major role. We recognized in this cluster history one of the essential dimension of relational proximity Saxenian (1994) has had previously noticed in Silicon Valley, when she said that "*Silicon Valley is a regional network-based industrial system that promotes collective learning an flexible adjustment among specialist producers of a complex of related technologies*", adding the weight of social networks in these collective and flexible learning and adjustment.

[10] In order to qualify these predecessors, David (1988) has spoken about *relevant neighbors*.

Recapitulative synthesis

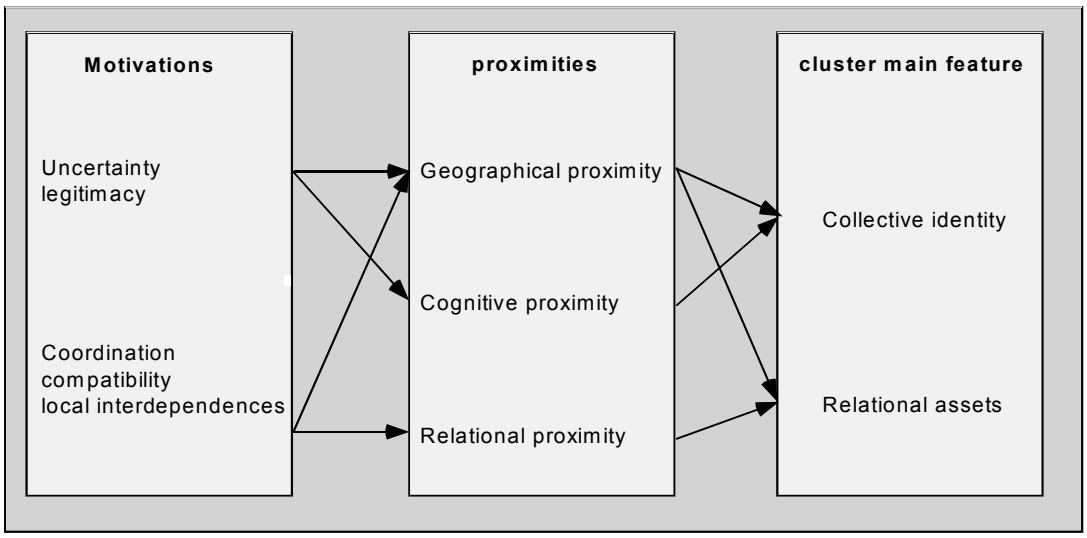


Figure 4: mimetic interactions and proximities

Figure 4 tries to propose a recapitulative synthesis of the complex links between proximities and mimetic processes of location decision making. Recall that we have not focused directly on the nature and definitions of proximities, but first on the processes of location giving rise to convergence on location decision making and to such or such proximity. Recall also that we have supposed that location processes are always sequential and based on firms endowed by heterogeneous preferences.

The main result is that the key feature of clusters depend on the combination of cognitive, relational and geographical proximities. On the one hand, in clusters in which uncertainty of the pay-offs of each location alternative and the necessity to be better identified and legitimated by consumers or financiers are strong, clusters can exhibit geographical proximity and cognitive one. These interrelated proximities give rise to a strong collective identity to clusters, because firms converge on location decision making but also on managerial or organizational practices, above all in a context of emergent activities or sectors. Most of time, firms of these clusters compete each other in less differentiated markets.

On the other hand, when technological complementarities and convergence imply coordination in the innovation process, clustering processes give rise to geographical and relational proximities. Collective identity of clusters can be strong, but what insure the performance and the attractiveness of these clusters is that there exhibit un sort of collective relational (and specific) asset, and local interdependences, generally in monopolistic markets.

Of course, the reality of clusters is more intricate than the "discrete case" of this typology. Each cluster can certainly be analyzed according to peculiar combinations and degrees (a continuum case) of collective identity and relational asset in space and time. Nevertheless, such a typology is well-suited to analyze not only the socio-economic nature of proximity, but either the location process giving rise to proximity. In the following sections, we propose an empirical study of an extreme case of mimetic process of location based on uncertainty and legitimacy. The purpose is, first, to test and illustrate our typology, second to study the collective efficiency of clusters according to the mimetic location decision making governing the clustering process.

Success and decline of the French 'Silicon Sentier' (1998 – 2002)

Silicon Sentier can be considered as the main agglomeration of Internet firms in France during the period 1998-2002. One can refer to objective initials conditions. But one can also explain the emergence of Silicon Sentier has the result of a collective mimetic behavior based on individual and sequential strategy which confers some peculiar structural property to the district. Precisely, different kinds of proximity dynamics have played a crucial role in the explanation of success and decline of this ICT cluster.

The cluster emergence initially was clearly supported by the situation of the property business in this place in the middle of the 1990's, following the crisis of textile activities. The existence of very vast buildings making possible the installation at lower cost "open spaces" represented a first incentive for the Internet pioneers to locate in this place.

"There were many spaces to rent because the Sentier was in crisis at the end of the 1990s. Since 1992-1993, there is a representation crisis and thus less business in the Sentier: thus the rents were not expensive at the beginning " (start-up leader)

" In fact the very low rental fees especially attracted us "(Yahoo, Libération, December 1998)

The second argument pleading in favour of the arrival of the first start-up is related to an unequalled quality of connection to the large international backbones. France Telecom opened in the spring 1998 its principal GIX named PARIX and located at the centre of the Sentier.

" It was the best district connected to international Internet backbones "(Yahoo, Agence France Press, March 2000)

" If all the start-up are installed in this district, it is because it was historically the first cabled district " (start-up founder)

Lastly, the last argument pleading in favour of a location in the district, independently of the location of the other start-up, relates to the specificity of the labour market in the ICT sector, at least during the time of the Internet bubble swelling. Indeed, if one follows Suire's analysis (2003), the creative labour characteristic of the start-up is looking for urban amenities. Located in Paris centre, the district has the advantage of being easily accessible by public transportation while being physically located in the economic activity centre. In addition, the district is alive anytime a day. Thus, it was possible to organize meetings in the district café's or to go and have a drink after leaving the office. For all these reasons, many people underlined the specific atmosphere which emerges from this district by opposing it to the traditional business districts of Paris (in particular La Defense).

"The advantage, it is that you walk to your rendez vous in five minutes. And you can have a beer after the office working time. The district also corresponds to types of people (young people...)."(start-up founder)

" There is the side "hype" which arrives in a specific district [...] There is also an opportunism, the will to create a new relationship between people, a new link with the city (to use public transport more than cars). There was also a reaction towards the not very convivial tower blocks (separation work district /personal life). There is in the Sentier an idea of mixity: one works where one lives. When we started, many young people had their flat next to the buildings "(start-up founder)

Below these pure economic factors, one has to explain why that during the time from the beginning of the 1999s to the mid 2000s, approximately 300 start-up of the infomediation

sector were located in the district, either foreign subsidiary companies (Lycos, Spray, Boo.com, AOL), French start-up, such Alafolie.com, Monte Cristo, Multimania, Caramail, Nomade, Liberty Surf, Last-minute.com, Buycentral.fr, Magic Emilie, Net2one... or others, more anonymous. Mimetic interactions and proximity have played a major role and have quickly underpass these pure economic factors.

A geographical and cognitive proximities…

The uncertainty prevailed, in particular in the context of the Internet-based economy in which the business models are little stabilized and in which the need to be identified is rather strong. The convergence of the start-up location decision making can thus, for this reason, be regarded as the result of an informational cascade, resulting from the aggregation of the individual locational choices of these start-up. These strategies are closely related to a process of observational learning.

" At Nomade, one of the French-speaking Internet guides, we admit having been allured by this reputation of "district of the Web" : the company will move from Vincennes to the rue Réaumur in January "(Libération, December 1998)"

"There was a fashion effect which consisted in saying that we were in the Sentier." (start-up founder)"
" My name is trouvtout.com', I belong to the Silicon Sentier should be more identifiying than 'my name is trouvtout.com', I belong to Paris'. "(In charge of new technologies with Bercy, Libération, January 2000)

"In the Sentier, there mere mythical places : Free, Spray head offices... We did the same: we took rotted buildings rue de Turenne"(start-up founder)

Thus this convergence of locational choices has created legitimacy and a collective identity specific to this cluster during the period before the bubble crash. This collective identity has engendered positive feedbacks effects on the individual reputation of the district start-up. In particular, by imposing such a label, the Net-economy actors facilitated the work of the start up belonging to their community, in particular acting of the research of the sources of external financings (venture capital), on which the business models of start-up are based.

"The Silicon Sentier, that remains a joke, but we never know: by speaking about it, perhaps it will end up becoming a reality "(Médiangles, Libération, December 1998).

"That will facilitate the start-up creators job when they present their projects in front of the capital-riskers. They will seem to be identified as located in a territory which is lucky "(Jean Ferré, for Creascope, January 2001).

As a consequence of this locational cascade, the cluster became gradually, from 1998, the place France waited for its e-economy. This district was the subject of a strong attention in medias, thus taking part in the reinforcement of the locational norm.

"*Le Sentier : its films with success, its wholesalers in clothing and... its Internet start-up. In January 2000, the Parisian district became the emblem of the new economy made in France. It was the time of the stock exchange euphoria, of the "Netmania"... The Hexagon discovered that a generation of young people had invested the old textile workshops of Paris"(Le Monde, March 2000)*

Geographical proximity is a key characteristics of the cluster and both the convergence of choices of location and the sequentiality of interactions have strongly driven the path-development of the cluster. One can think that if the first companies leaders of the Net-

economy had not been located in the centre of Paris, and this in spite of the few advantages of the site, such a process would not have emerged in a so fast a way and other districts could have been candidates for such a success. This norm of location has been simply built on a mimetic dynamics which "cumulatively brings to the idea that to be elsewhere could be an error" (Suire, 2003, p. 387).Young and talented people who belong to those starts-up shared a common adventure, in a way there were very few cognitive dissonance between them. Many of them were well educated, shared the same organizational design principle, the same management rule, the same style life…to put it in a different way, the cognitive proximity were very important :

"*There are fashion effects : for example, we dress as we like, we live it up , we make business in the evenings. There is a lot of imitation. There were about 80-100 young managers who tried to combine business and festivity : it is the funky business with its evenings and its buzzwords [...] the use of the" tu" should be adopted, to be open... "(start-up founder)*

" the start-up microcosm creates many rules for itself : to work during the night, to do everything together... It is a lot of responsibilities put on too weak shoulders but nevertheles it is good. I also like the flat hierarchy concept (I do not have to play small chief at 26). The only thing different from the others here is my armchair. But I do not have the higher wages in the enterprise. We will not reconsider the flat hierarchy , the responsibilities entrusted to young people... The only a bit complicated trick, is to make the difference between professional life and personal life : there are many start-up where people lived together, have sex together... It is not good "(start-up founder)

... Without relational proximities

The analysis could be stopped there if the objective had been the analysis an e-business success story. However, one can disregard the crisis of the Net-economy following the bubble Internet crash at the end of 2000, and its consequences on the Silicon Sentier attractiveness. One of the first consequences of this crisis has been the recognition that the Silicon Sentier has rested on few relations and local productive and innovative interdependences. The first economic arguments gradually disappearing (building rental fees and backbones access), Yahoo has been the first firm to relocate out of the Sentier, and many others have relocated at different places. Parallel to these relocations, the district loses the essence of what we identified like a collective identity: the "funky business". This institutional isomorphism had broken up, and the managerial practices and speeches were quickly turned over towards more traditional receipts, characteristic of SME. Here also, the wave of rationalization known by the Internet pioneers spread on the whole community.

"We are mainly a publisher which has an Internet activity t"(start-up founder)

"We are finally a software firm which makes games" (start-up leader)

" At the beginning, to be called start-up was an advantage but today, it is a disadvantage: the term of start-up is denigrated and I define myself not like a start-up but like a SME. And I am not the only one. It was seen that Internet was not the goose that lays the golden eggs. Today, it is old-fashioned to say start-up: people think "it is still wind and it will file for bankruptcy". We did a traditional trick: we earned money "(start-up founder)

Step by step, the label Silicon Sentier lost all the legitimacy which it had acquired at the time of the NASDAQ euphoria.

"*For me, there was not a Silicon Sentier religion. It is just, practical and not expensive [...] But today it gives a very bad image : it is better not to be in Le Sentier. Many firms went away*

because the buildings are more expensive and because there were bankruptcies "(start-up founder)

" We are in Silicon Sentier but I do not feel it because I do not have time to try on my suits at the "pouet-pouet" lunches : I have to manage my business return" (start-up leader)"

"Silicon Sentier" became "Silicon Désert"... "(Founder of start-up)

"(the Sentier) it was enjoyable. But for our public image, we preferred to move in 8th, it is more serious "(Streanpower leader, Paris Obs, 2003)

If cognitive proximity can be considered as a strong characteristics of talents inside the cluster, the sharing of common value is not a sufficient condition to stimulate constructive social interactions and relations. While exchange of information or networking activities that support the diffusion of tacit knowledge is a key factor of success of Silicon Valley or Sophia Antipolis, there were only façade of social mechanisms inside the Sentier. Beyond the absence of productive partnership, relational proximity was not exactly stimulated in a right and efficient way.

"We have developed Internet partnerships with Lycos, Caramail, Chez.com : we remunerates these sites according to the purchases they make in our firms. But we were mistaken because these partnerships do not work "(start-up founder)

"It is very true in the Sentier : anytime a financier is pointed at the end of the street, there are no more friends "(Lawyer specialized on the start-up)

" At the beginning there was an extraordinary boom in the creation of start-up, and so a strong need for qualified labour in a context where the labour force was weak. At that time, the start-up pricked people the ones the others. Collaborations could only be limited. Within the First Tuesday, the chairmen did not want to send their employees to represent the company because they were discharged by other chairmen "(Journalist)

A strong geographical and cognitive proximity built on a mimetic and sequential decision of location but an absence of relational proximities are the key points to understand the speed of (de)clustering of Internet firms inside the *Silicon Sentier*. The dialectic of different forms of proximities exposed above and tested in the case of the Sentier is also a key entry to understand both the performance and the evolutionary stability of a cluster.

Proximities, collective efficiency and stability

If clusters as locus of regional growth and knowledge creation have been the subject of a growing literature in these ten years, few works have been concerned by their properties of stability. In this final section, we stress on the stability properties of clusters in a dynamical sense, that is to say their capacities to resist to exogenous shocks and to exhibit a continuous growth, rather the neoclassical notion of stability linked to equilibrium. For that, recall that in the survey of models and theories of mimetic interactions, we have identified three topics or goals that engender mimetic interactions and convergence in behaviors (*Table 1*). We have already stressed on the two formers, uncertainty and legitimacy on the one hand, coordination and compatibility in the other hand. Now, the aim is to show that the third is essential to understand the intrinsic stability of clusters, and in that way, to show that geographical and cognitive proximity are not a sufficient condition for this purpose.

As a matter of fact, we have shown that mimetic interactions can be explained according to different individual motivations. If the result seem to be the same – firms converge in location decision making and a cluster emerges – it differs strongly on the stability properties. For that, we have to compare the model of locational cascade to the model

of increasing returns to adoption and see in the model of rational imitation of Hedström (1998) the key assumptions for interpret the stability of collective behaviors.

Firstly, in the model of locational cascade, firms tends to converge in location decision making because mimetic behavior is a rationally way to reduce uncertainty and increase legitimacy. If we look closely to the pay-offs of firms (Vicente, Suire; 2005), we can see that individual pay-offs do not increase when individual behaviors converge. The only thing which increases is the probability to obtain a fixed pay-off, but not the pay-off itself. In other words, the structure of pay-offs do not evolve and firms do not gain from their proximity. In that way, the non deformation of pay-off structure can thus be a major source of instability of clusters, and it is always possible that an exogenous shock or a succession of informational shocks breaks the locational cascade. Empirically, we have seen such a breaking in the Silicon Sentier after the internet bubble crash and the relocation of Yahoo that engenders quickly the decline of the cluster. So we can say that cognitive proximity coupled to geographical proximity is not a sufficient condition for stability and continuous attractiveness of clusters. Our analysis is closely akin to one of Boschma (2005) who shows that cognitive proximity can be a strong source of unintended spillovers when firms compete in same markets and are closely co-located. Moreover, it is always possible that the convergence of decision location making gives rise to a collective inefficiency (an *incorrect cascade* according to Bikhchandani & alii (1998)), if congestion effects appear and are not compensated by evolving pay-offs due to proximity. That is once again one of the reasons of the ephemeral success story of the Silicon Sentier.

Secondly, in the model of increasing returns to adoption, the individual pay-offs evolve as soon as location decision making converge, so that the process is strongly path dependent and the possibilities of reversal are reduced as soon as the clustering process grows. Local interdependences, formalized by network externalities, reinforce the attractiveness of clusters and the relational asset. Once again, if we look at the model of Arthur in details, we can associate this path dependence process to the fact that Arthur has introduced a endogenous evolving pay-off system to formalize the benefits firms gain from their proximity. At the opposite to Silicon Sentier, Telecom Valley in Sophia Antipolis and the emblematic case of Silicon Valley have shown their capacity to resist to the Internet bubble crash and maintain their attractiveness, due to technological complementarities and variety in the innovation process. Relational proximity is a strong source of stability because of the interdependency of the individual pay-offs in the collective structure, which make costly individual relocation strategy. Here, we are closed to the works of Saxenian in the weight of network effects in competing clusters, ones of Scott (2004) for whom relational proximity has to be better interpreted in terms of division of labor than competition strategies, and also the works of Uzzi (1997) who show that the lack of social network relationships in comparison with the weight of the so-called "arm's length relationships can be a strong basis of organizational decline.

Behind the analogy of label of most of ICT clusters, different forms of learning process and mimetic interactions are hidden (Vicente, 2003). Hedström (1998) already identified such a difference in the general case of rational and mimetic behaviors. According to him, mimetic interactions can exhibit different patterns of aggregate behaviors which depend on the nature of the evolving system of individual pay-offs in the aggregates dynamics. On the one hand, we can suppose that convergence of behaviors (location decision making for our purpose) is a pure self-fulfilling process, that is to say that firms, as in the Arthur model, are in situations when the value of a particular decision is an increasing function of the number and the proportion of agents who have chosen this decision. Such a self-fulfilling process, generally interpreted as a prophecy, can be easily explained by collective learning, innovation, trust and

finally success on monopolistic markets. On the other hand, we can also suppose that this convergence process is a self defeating process, that is to say that firms, closely to informational cascade models, are in situations when the value of a particular decision is a decreasing function of number and the proportion of agents who have chosen this decision. Such a self-defeating process can be explained in the literature by the fact that firms compete strongly and distrustingly, do not cooperate and either can be affected by spatial congestion effects.

Using these assumptions in a spatial version of the general Hedström model of rational imitation, we can show that the nature of the evolving pay-offs system is the critical feature of the stability of the aggregate behavior (*see appendix*). If a self-fulfilling process dominates the dynamics of mimetic interactions, a sort of reinforcement process of beliefs occurs and firms converge to a lasting locational norm. At the opposite, if a self-defeating process dominates, an erratic and cyclical aggregate behavior occurs, as in fads and success stories phenomenon. In that way, if geographical coupled to cognitive proximity is not a sufficient condition for the increase of individuals payoffs, clusters exhibit chronic instability. At the opposite, the relational proximity, because of its increasing pay-offs potentialities, appears as a strong basis of stability and attractiveness of clusters.

Concluding remarks

In this paper, we have tried to link recent and stimulant researches on proximity dynamics to the advances on mimetic interactions which govern co-location processes, in order to obtain results on the emergence of clusters in knowledge based economies and their dynamical stability. In that way, we have shown firstly that it would be relevant to analyze clustering processes by supposing that firms decide to locate sequentially and have heterogeneous preferences of location. Secondly, we have demonstrated that this sequentiality is a strong basis of communication, observation and coordination between firms, which can give rise to rational mimetic interactions and convergence in location decision making (geographical proximity). Thirdly, we have also shown that according to the mimetic process at work in the aggregation process, the very nature of socio-economic proximity differs. If uncertainty and legitimacy dominate, the convergence of location decision making can give rise to cognitive proximity, while if coordination and innovative interdependences dominate according to the degree of competition and the division of labor, the convergence process leads to a relational proximity. Finally, we have tried to go beyond the emergence of clusters to invest their economic properties of stability. The key result is that according to the mimetic process at work and to the nature of socio-economic proximity, clusters can exhibit different stability properties, as we have tried to show in the emblematic French case of *Silicon Sentier* (compared with others). We think that such a result has to be theoretically and empirically improved in the future.

Notice that clusters are not the one category of networks that exhibit socio-economic proximity and also innovation and economic growth. In this paper, we have only focus on clusters in order to study the ambivalent links between geographical proximity and socio-economic ones. Nevertheless, we are convincing that innovation, growth and performance are not totally and exclusively affected by geographical proximity. Following Simmie (2003) and Zimmermann (2001), the key features of performance of clusters is also in the intensity of interactions outside clusters, and we have to invest this question in upcoming researches.

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Appendix

A model of rational imitation in location decision making:
Convergence (in) and stability (of) aggregate outcomes
(From Hedström, 1998)

On assume that each firm assign a unique value β to each alternative of location, and that the probability for a firm to locate in a particular place is equal to its β -values divided by the sum of the β -values of all alternative places. The probability of firm *j* to choose place *i* at time *t* is then equal to:

$$P_{ijt} = \frac{\beta_{ijt}}{\sum_{i=1}^{k} \beta_{ijt}}$$

The β -values are assumed to be influenced by the firms' own assessment of the likely utility values of the various places and by the past location choices of others. Moreover, it will be assumed that the β -values are weighted according to a linear combination of these two sources of influence:

$$\beta_{ijt} = w_j S_{it} + (1 - w_j) V_{ijt}$$

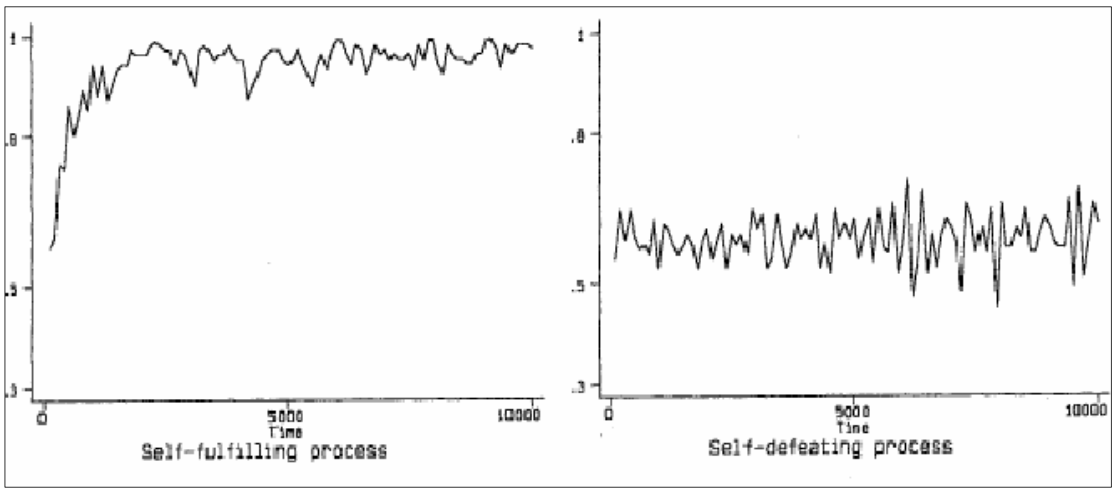
where,

$w_j \in [0,1]$ describes the relative weight the firm attaches to the past location of others,

S_{it} describes alternatives share of cumulative location made until $t-1$,

V_{ijt} describes the assessment of firms *j* on the likely value of each location *i* at time *t*. These values are chosen according to a *self-fulfilling* or a *self-defeating* (Schelling, 1978), describing the respective weight of network externalities and informational externalties.

Simulation results give an interpretation of the convergence (in) and of the stability (of) aggregates outcomes.



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